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these will occur in the way the cells have been previously exercised,—the same neural series, the same mental accompaniments. Lack of exercise leads to atrophy of nerve-cells just as it leads to atrophy of any other kind of cells. Forgetting is therefore a nutritive effect; unexercised cells finally become too feeble to break through the points of cell-separation with sufficient intensity to set off the next cells in the chain and thus arouse the memory.

So far Verworn. He is indisposed to admit any factors except those nutritive ones that apply to all kinds of living cells. He regards the greater instability of the protoplasm of the developed cells as the result only of greater mass with the consequently greater tendency to break down. He admits the possibility of changed chemical structure in the exercised protoplasm, but considers it problematical and unnecessary to an explanation of the phenomena.

Goldscheider lays more emphasis upon changed molecular structure. In this connection he makes use of Verworn's *Biogenhypothese* and Ehrlich's *Seitenkettenhypothese*. He also ascribes greater importance to the fibres. He thinks those fibres and portions of fibres that are exercised will acquire greater functional instability than the unexercised ones. An incoming impulse will therefore tend to discharge along those fibre-branches that have been rendered most permeable by exercise, and to avoid those more stable non-exercised fibre-branches. He makes much of the neurone-ends where the impulse passes across from one neurone to another, regarding the protoplasmic molecules of these regions as particularly unstable. His view may be illustrated as follows:

An object presented before the eyes, for example, simultaneously arouses a number of cells in the visual area. Where a fibre from one aroused cell is in functional contact with a fibre from another aroused cell, the activity in each fibre affects the catabolic changes going on in the other, resulting in a greater chemical disintegration in each fibre than would have been the case if the other had not been active at the same time. This greater catabolism leads in the following state of rest to greater anabolism, and, consequently, greater instability in these adjacent exercised fibres than in any of the other fibres which may have been just as near but which were functionally inactive at the time. Thus are formed associative lines of least resistance through fibres simultaneously stimulated (*Knotenpunktlinie. Kraftlinienresultante*). Frequent repetition of the simultaneous stimulations accentuates the effects and renders the lines of conduction more permeable and more permanent.

In the same way fibre-lines of low resistance and high powers of influence are formed by functional exercise between dissimilar sensory areas, between these and motor areas and the like. There may be many intermediate cells and neurone tracts. The one important factor is the nutritive result all along the line of high potential energy due to mass and molecular structure, and the low threshold of both cells and fibres due to a heightened instability in the protoplasm. At first the lines will possess unequal degrees of development at different points along their course; the result will be deflections, inaccuracies and error. Practice will have a cumulative nutritive effect, producing in time a uniform permeability in all parts with attendant ease, rapidity and precision.

J. F. BOBBITT.

Die Mechanik des Geisteslebens, von MAX VERWORN. Leipzig, B. G. Teubner, 1907. pp. 104.

This little book gives the practically unchanged text of a series of five popular lectures on the 'mechanics of the mental life.' Lecture

I, 'Leib und Seele,' discusses the origin of the dualistic view of mind and body, and its seeming naturalness to the average civilized man; analyses the concept of outer 'reality;' and concludes with the formulation of a sensationalistic monism. "Es existiert nur eine unendliche Mannigfaltigkeit von Inhaltsbestandteilen der Welt, die sich gegenseitig in gesetzmässiger Weise bedingen." "Die Forschungsprinzipien können in letzter Instanz auf allen Gebieten immer nur die gleichen sein. Sie bestehen allein darin, für einen Vorgang oder Zustand, den wir wahrnehmen, sämtliche Bedingungen zu ermitteln." Lecture II treats of the conditions of mental process as shown in the action of stimuli upon the nervous system; it is entitled "Die Vorgänge in den Elementen des Nervensystems." A sharp line of distinction is drawn between the function of the cell-body and that of the nerve fibre. "Der Nerv leitet keine Lähmungsvorgänge, er leitet keine Narkose, er leitet keine Hemmungsprozesse, er leitet nicht das Absterben einer Zelle, er leitet nicht die Assimilationsvorgänge, er leitet nichts anderes als einzig und allein dissimilatorische Erregungen der Zelle, die so mit einer anderen in Verbindung setzt." The seat of sensation and idea, "das Wesentliche für den Enderfolg," is without any doubt the ganglion cell. Lecture III, "Die Bewusstseinsvorgänge," traces the doctrine of cerebral localization from Gall to Flechsig; gives the neural schema for sensation and voluntary movement; interprets the association centres as "Vorstellungszentren im weitesten Sinne;" and explains memory, the process of learning, on the analogy of muscular practice. Lecture IV, 'Schlaf und Traum,' reviews in unsystematic fashion various theories of sleep, and concludes that sleep is induced by a complex of conditions,—cellular fatigue, due to the continuance of dissimilative excitation by way of the nerve-fibre, and the removal of external stimuli. Dreams are states of partial waking, conditioned upon a local excitation (by internal or external stimuli) of the cerebral cortex. Lecture V, 'Suggestion und Hypnose,' presents hypnosis as a state of extreme suggestibility, "einen echten Wachzustand, in dem prinzipiell nichts anderes geschieht, als was im normalen Wachzustande passiert,"—a state of concentrated attention upon a single point determined by the operator. The conclusion repeats the position taken up at the outset. "Materie und Psyche, Körper und Geist, Leib und Seele, existieren für uns nicht als Dualität. Es existieren nur Dinge und Vorgänge von einheitlicher Art, ganz gleich, ob sie ausserhalb unseres Ich oder in unserem Ich sich finden. Ihre Analyse kann nur immer darin bestehen, die gesamten Bedingungen zu ermitteln für die Zustände und Vorgänge, die wir beobachten."

For the style of the book we have nothing but praise; the lectures read easily, and must have been delightful hearing. The contents are less satisfactory. The crude epistemology of Lecture I may be passed over. But the cells and fibres of Lecture II show us nothing whatever of the total mechanism of the nervous system,—the very thing, one would suppose, about which a popular audience would desire information. Lecture III is psychologically inadequate; mind is made equivalent to intellect, and attention and feeling and emotion are wholly ignored. In Lecture IV Professor Verworn has not availed himself of the latest and best results with regard either to sleep or to dreaming. The lecture on hypnosis is clear and interesting, but it runs altogether on the descriptive level. On the whole, while it may be readily acknowledged that the lectures did, and that the book will, do good, it must be said that the good is much less in amount than it might have been. Psychologists must continue to write their own physiological psychology, so long as the physiologists *von Fach* make no more of it than Professor Verworn has here done.

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